Offshore Wind Projects: Who Cares About Environmental Impact Significance?

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ABSTRACT

This research aims to investigate how the significance of impacts is determined in Environmental Impact Statements (EIS) for Offshore Wind Energy (OWE) projects to identify potential improvements in this process. We examined EISs from England, where OWE Environmental Impact Assessment (EIA) practices are well established, and compared them with those from Brazil, where there such experience is incipient. The studied EIS provided valuable insights for enhancing the description and justification of the choice of standards, assumptions, and value systems used to assess significance. However, the analysis of significance revealed a common gap in all the analyzed EIS: none considered the significance of impacts from the perspective of the affected community or society. The findings highlight the urgent need to improve the quality of significance analysis in the Brazilian expanding demand for OWE. Strengthening these aspects is essential to ensuring transparency, robustness, and more rigorous significance determinations in Brazil and other emerging markets.

INTRODUCTION

The global effort to expand renewable energy has rapidly advanced in recent decades, with offshore wind energy (OWE) projects gaining prominence (Hall et al., 2022). While wind energy is widely recognized as a more sustainable power source, its implementation can lead to significant environmental impacts (Phylip-Jones and Fischer, 2013). Given these potential impacts, Environmental Impact Assessment (EIA) plays a fundamental role in shaping development actions by critically examining OWE projects early in their conceptualization. EIA helps identify significant impacts and foster informed decision-making, ensuring mitigation efforts focus on the most relevant environmental and social concerns (IAIA, 2012).

EIA is one of the most well-established instruments for promoting sustainable development (Gómez-Priego and Bojórquez-Tapia, 2023). A key component of best-practice EIA is ensuring highquality Environmental Impact Statements (EIS) that focus on significant environmental impacts, providing a solid foundation for better-informed decision-making (Rathi, 2023). Thus, an essential stage in the EIA process is determining the significance of impacts, as it directly influences the environmental viability of a project (Fonseca et al., 2020). By assessing the most relevant environmental impacts, this process provides decision-makers and stakeholders with essential information to guide mitigation measures and approval decisions (Duarte and Sánchez, 2020). However, the criteria and methodologies used for determining significance can vary widely (Noble, 2020).

This study aims to investigate how the significance of impacts is determined in EIS for OWE projects to identify potential improvements in this process. To achieve this, we examine EISs from the United Kingdom (UK), where OWE EIA is well established, and from Brazil, where no OWE projects have been implemented yet and only two EISs have been completed. The UK holds Europe's top offshore wind capacity and ranks second globally. By May 2024, 12.3 GW were under construction, with over 100 GW at various stages of development (Global Wind Energy Council, 2024). The UK has an EIA system with long-established practices, clear guidelines, and strong

governance mechanisms that enhance transparency, decision-making dynamics, and environmental attitudes (Arts et al., 2012). This study focuses exclusively on England due to its leading role in offshore wind development within the UK, hosting most of its installed capacity (Renewable UK, 2025). Brazil offers favorable conditions for OWE projects, and recently, a Law enacted in January 2025 regulates the utilization of offshore energy potential (Brazil, 2025). The country has emerged as one of the leading nations in Latin America to initiate the environmental licensing process for OWE (Gorayeb et al., 2024), which needs guidance from the international experience.

METHODS

As of March 2025, 104 projects were submitted to the Brazilian federal environmental agency (Ibama) for the licensing process, but only four had submitted studies. Two proponents presented EIS, while two others provided simplified studies for pilot plants. For this research, only the two EISs were analyzed (Figure 1). The EIS documents were accessed through the Electronic Information System of the Ibama¹.

In the UK, a search for EISs was conducted through the Nationally Significant Infrastructure Projects repository². Of the 12 EIS from OWE projects in England identified, those meeting the following inclusion criteria were selected for analysis: the most recent and those prepared by different consultancy firms. These criteria were deemed appropriate to identify current practices in English EISs. We identified 4 EIS that met this profile (Figure 1).

Country	ID	Year	Project	Developer Consultant		Number of Turbines	Power	
Brazil	BR1	2019	Caucaia Offshore Wind Farm	BI Energia	Ten Project Estudos e Projetos de Energia Brasil	59	598 MW	
	BR2	2021	Dragão do Mar Offshore Wind Complex	Qair Marine Brasil Geração de Energia	Energo Engenharia e Consultoria	128	1216 MW	
England	EN1	2024	Five Estuaries Offshore Wind Farm	Five Estuaries Offshore Wind Farm	GoBe Consultants	79	>100MW	
	EN2	2024	Morecambe Offshore Windfarm Generation Assets	Zero-E Offshore Wind S.L.U. and Flotation Energy	Royal Haskoning DHV	30 - 35	~480 MW	
	EN3	2024	Outer Dowsing Offshore Wind	TotalEnergies, Corio Generation and Gulf Energy Developments	SLR Group	Up to 100	1,5 GW	
	EN4	2024	Dogger Bank South Offshore Wind Farms	RWE Renewables UK Dogger Bank South (West) and RWE Renewables UK Dogger Bank South (East)	RWE	Up to 200	>100MW	

Figure 1: Key information from the analyzed EIS

The EIS review was done using the "Reviewing the Quality of Environmental Statements" method, the Lee and Colley protocol (Lee and Colley, 1992). This widely recognized framework is frequently employed in research within the field of EIA. Candiani et al. (2025) provided a list of several studies applying it to various project types. The method consists of 52 criteria that are divided into four evaluation areas. For this research, we focused on the area related to the identification and

¹ available at: <u>https://sei.ibama.gov.br/sip/login.php?sigla_orgao_sistema=IBAMA&sigla_sistema=SEI</u>

² available at: https://national-infrastructure-consenting.planninginspectorate.gov.uk/

analysis of impact significance. The EIS review followed the methodological procedures of Lee and Colley protocol, involving a detailed reading of each study and subsequent responses to the items listed under each criterion. A single specialist assessed the EISs, and to minimize potential bias, 50% underwent random reanalysis, following the procedure recommended by McGrath and Bond (1997). The protocol application allows for determining whether an EIS provides satisfactory information quality (grades A, B, or C) or unsatisfactory quality (D, E, or F), using the parameters indicated in Figure 2. The analysis focused on the three criteria related to determining impact significance (Figures 2 and 3).

Figure 2: Reviewing scores

0	Explanation	Evaluation parameters used for the application of the EIA review protocol					
Score	(Lee; Colley, 1992)	Criteria 2.5.1	Criteria 2.5.2	Criteria 2.5.3			
A	Generally well performed, no important tasks left incomplete.	The EIS describes the significance to the affected community and to society in general (with public participation). Additionally, it clearly differentiates significance from impact magnitude. The significance of residual impacts is also addressed.	The significance is assessed considering appropriate national and international quality standards and considers the magnitude, location, and duration of the impact, as well as national and local societal values (with public participation).	The EIS presents and justifies the choice of standards, assumptions, and value systems used to assess significance for all evaluated components. Any opposing opinions should be summarized.			
В	Generally satisfactory and complete, only minor omissions and inadequacies.	The EIS describes the significance according to the 'A' score but does not explain how the significance to the affected community and society in general is determined.	The significance is assessed according to the 'A' score but does not explain how the societal values is determined.	The EIS presents the choices according to score A but does not provide justification for all the assessed components.			
С	Can be considered just satisfactory despite omissions and/or inadequacies.	The EIS describes the significance according to the 'A' or 'B' score but only considers social impacts without indicating public participation in the significance determination.	The significance is assessed according to the 'A' or 'B' score but only considers social impacts without indicating public participation in the societal values identification.	The EIS presents the choices according to the A or B scores but does not provide justification for the choice of standards, assumptions, and value systems.			
D	Parts are well attempted but must, as a whole, be considered just unsatisfactory because of omissions and/or inadequacies.	The EIS describes the significance with more information than the 'E' score, but it cannot receive the 'C' score.	The significance is assessed with more information than the 'E' score, but it cannot receive the 'C' score.	The EIS presents more information than the 'E' score, but it cannot receive the 'C' score.			
E	Not satisfactory, significant omissions or inadequacies.	The EIS only describes the significance in a distinct way from impact magnitude.	The significance is assessed without considering one or more of the following: appropriate national and international quality standards; magnitude, location, and duration of the impact; national and local societal values.	The EIS presents a general scale for all the evaluated components.			
F	Very unsatisfactory, important task(s) poorly done or not attempted.	The EIS does not describe the significance of the impact for the affected community or society in general. Additionally, it does not clearly differentiate significance from impact magnitude. The significance of any residual impact after mitigation is also not addressed.	The significance is not assessed considering appropriate national and international quality standards, nor does it consider the magnitude, location, and duration of the impact, as well as societal values (national and local).	The EIS neither presents nor justifies the choice of standards, assumptions, and value systems used.			

RESULTS AND DISCUSSION

The results of the EIS review (Figure 3), indicate that both Brazilian EIS were deemed unsatisfactory, as none specified the methodological choices, standards, assumptions, or value systems applied, nor did they assess significance from the perspective of both the affected community and society as a whole, while also considering the environmental sensitivity of the impacted component. Additionally, the significance of residual impacts was not addressed.

Figure 3: Overall analysis using Reviewing the Quality of Environmental Statements method concerning the identification and analysis of impacts

Criteria from Lee and Colley (1992)				UK (England)			
ID	Criteria Description		BR2	EN1	EN2	EN3	EN4
2.5.1	"The significance to the affected community and to society in general should be described and clearly distinguished from impact magnitude. Where mitigating measures are proposed, the significance of any impact remaining after mitigation, should also be described."	E	E	С	С	С	С
2.5.2	"The significance of an impact should be assessed, taking into account appropriate national and international quality standards where available. Account should also be taken of the magnitude, location and duration of the impact in conjunction with national and local societal values."	F	E	С	С	С	С
2.5.3	"The choice of standards, assumptions and value systems used to assess significance should be justified and any contrary opinions should be summarised."	F	E	A	A	А	A

BR1 presented the determination of impact significance in a highly unsatisfactory manner. The study merely classified impact significance separately from magnitude (i.e., insignificant, moderate, or significant). It defined significance as 'the intensity of the impact's interference with the environment, which, together with other impacts, results in a loss of quality of life when adverse or a gain when beneficial.' This is a generic definition applied to all environmental components of the project. However, no information or justification regarding the methods and criteria used to determine significance was provided.

In comparison, BR2 performed slightly better than BR1 but still presents significant gaps in determining impact significance. The study presented a table indicating that the significance analysis considered the impact's magnitude, duration, and extent. However, all impacts were assessed using the same generic framework without justifying the choice of standards, assumptions, and value systems applied. The analysis also disregarded the sensitivity of environmental components and social values and did not address residual impacts. The EIS stated that 'the method for identifying, predicting, characterizing, and evaluating environmental impacts related to the planning, installation, operation, and decommissioning phases of the project is based on the experience of the professionals involved in the study'. While expert judgment can be valuable, it alone cannot provide an entirely defensible and flawless foundation for impact prediction and significance evaluation in EIA (Glasson et al., 2019). Similar unsatisfactory results regarding the quality of significance analysis in the Brazilian context have also been reported in studies evaluating other types of projects, using Lee and Colley's protocol as a reference (see Candiani et al., 2025; Veronez and Montaño, 2024).

In contrast, the quality of information presented in the four English EIS was far superior, and all were considered satisfactory. Considering the criteria used in this research, the quality of the four studies evaluated is quite similar. All of them presented a transparent method for the criteria used for significance determination, describing and justifying the parameters used to evaluate the magnitude of the impact and the sensitivity of each evaluated component. In other words, they minimally met expectations for determining the significance of impacts. In general, the central gap in the English studies was related to the lack of description of the impact significance to the affected community and society, and the absence of consideration of societal values. This omission of the perspective of communities in the determination of significance has long been a significant challenge in impact assessment (Lawrence, 2007; Noble, 2020). Despite the deficiencies identified in the English EIS, it is evident that the way these EIS presented and justified each element used for determining significance is undoubtedly a reference for improving Brazilian EIS. The need for greater clarity in determining the significance of environmental impacts is crucial for the effectiveness of the EIA process and ensuring the sustainable development of projects (Fonseca et al., 2020).

CONCLUSIONS

Despite the higher quality of England EIS in comparison the Brazilian ones, none of the analyzed EIS considered the significance of impacts from the perspective of the affected community or society at large. This represents a significant challenge for countries where OWE projects are already well-established and those where such projects have yet to be implemented. The findings underscore the urgent need to improve the quality of significance analysis in Brazilian EIA practices,

as the studies reviewed must be substantially enhanced to ensure EISs fulfill their intended role. The examined Brazilian EIS did not account for the sensitivity and value of affected environmental resources and the social importance of the impacts, nor did they provide a straightforward method for determining impact significance, as suggested by Ehrlich and Ross (2015). The lack of transparency in the criteria used to determine significance further undermined the credibility of the information presented. In contrast, the English EIS demonstrated a more structured and transparent approach, justifying the parameters used to determine impact magnitude and the sensitivity and value of each environmental component. Despite some gaps, the English EIS should be considered a valuable reference for improving EIA practices in Brazil and other emerging markets.

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